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AMERICAN DYESTUFF REPORTER

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JUNE 26, 1939

VOLUME 28 NUMBER 13

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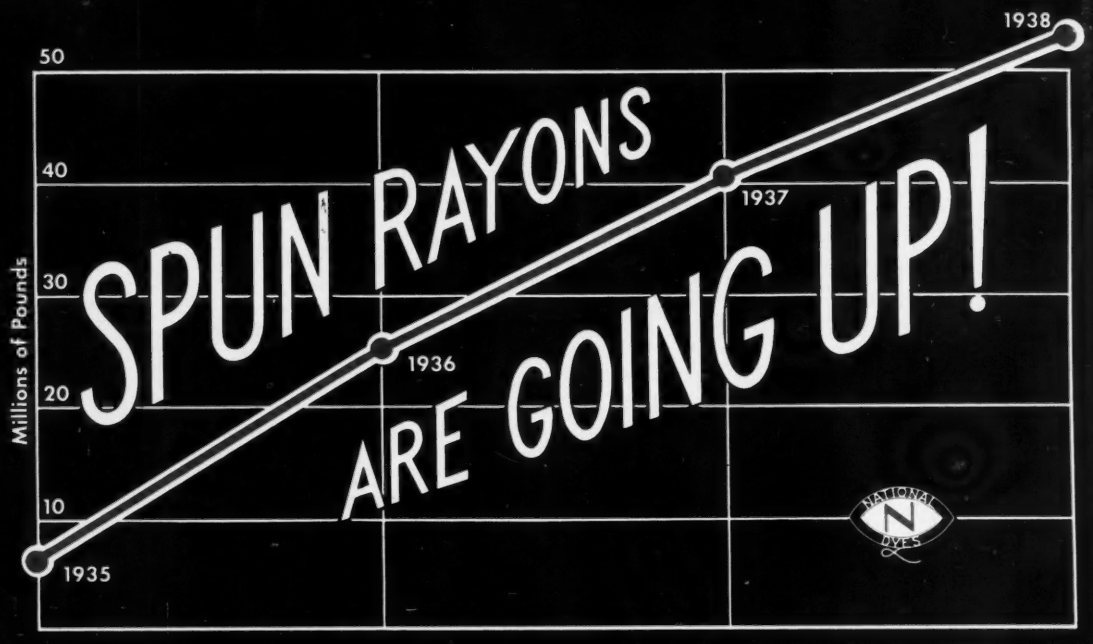

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ANNUAL MEETING and CONVENTION

The date of the Annual Meeting has been chosen to coincide with the closing date of the Annual Meeting of the American Chemical Society which starts in Boston on Sept. 11, 1939. This will give persons who are members of both organizations an opportunity to attend both meetings.

Members from the South and West, coming through New York, may stop off to attend the World's Fair.

• Headquarters—Copley-Plaza Hotel •

BOSTON, MASS., SEPT. 15 and 16, 1939

MEETING, RHODE ISLAND SECTION

THE April meeting of the Rhode Island Section was held on April 28th, 1939, at the Providence Engineering Society Rooms, 195 Angell St., Providence.

At a short business meeting the following officers were elected for the coming year:

Chairman, Allison R. Fletcher; Vice-Chairman, Ben Verity; Treasurer, Robert R. Farwell; Secretary, Louis D. Fleming; Councilors, Peter J. Ariente, Frederic A. Prisley.

It was voted to hold the Annual Outing on June 9th, and George A. Slade was appointed chairman of the outing committee.

After the business meeting a very interesting motion picture was shown which was made and presented by the Du Pont Company, entitled "Better Things for Better Living Through Chemistry."

The first speaker of the evening was Professor Earle K. Strachan of Brown University, whose subject was "Humidity." As an introduction to his talk Professor Strachan said: "Once most of our knowledge of industrial chemistry was entirely empirical and each individual industry was regarded as an isolated problem. About a generation ago certain chemists decided that in industrial chemistry one industry had something in common with others. That is, if we were to investigate filtration in one industry we would learn something about filtration which would be of benefit to other industries, and so with other processes. It was finally discovered that there were not more than fifteen or twenty essential operations and that all of our manufacturing processes were made up of a series of these operations. They distinguished the unit operations and found there is only a limited number of them. Such developments as you see in the films of the chemical industries are possible in that form only because the chemical manufacturers have studied the unit operations and put them to use.

"Three of these unit operations are fundamental to all others. They are, first, transfer of fluids; second, transfer of heat; third, diffusion, or transfer of matter from one phase to another. Developed from these we have a number of operations such as evaporation, humidification, drying, size reduction, mixing, filtration, and some ten or twenty distinct operations.

"The subject of the evening depends on diffusion processes or transfer of matter either from liquid water to water vapor, or vice versa; or, the transfer of moisture from a solid material to a vapor, or vice versa. We call these evaporation, humidification, drying, and in the textile industries, conditioning or moisture regain. These all depend upon the diffusion of a gas through another gas, or a solid."

Professor Strachan then presented various humidity charts on the screen, the first of which showed methods of measuring humidity. The second chart was entitled "Equilibrium Moisture Curves" and showed the relation of the moisture content or regain of various textile materials and the humidity of the surrounding atmosphere. He said:

"These curves represent the state of affairs under equilibrium conditions. During the processes of drying or humidification equilibrium does not prevail but rate of reaction is the prime consideration. The rate of drying is conditioned by the difference between the existing moisture content and the moisture content that would be present under equilibrium conditions. It is also conditioned by the rate at which moisture will diffuse through the air film surrounding the material which is being dried. When a piece of material starts to dry the water starts to evaporate, and as soon as this happens a film is formed in which the moisture content is higher than in the main body of gas immediately surrounding the piece of material. Very soon this film of air is completely saturated and no more evaporation will take place. The drying process is retarded by the force required to make the water diffuse through the surface film. Therefore there is a diffusion resistance involved in the drying process."

A third chart was displayed showing how the rate of drying is related to the moisture content of the material. The speaker further stated: "At high moisture contents the rate of drying is a constant number of pounds per hour independent of the amount of moisture present. However, below a certain moisture content, characteristic of the material, and known as the critical moisture content, the rate of drying decreases as the moisture content decreases.

"The rate of drying is always faster when there is a current of air. During the constant rate period the rate of drying is proportional to 0.8 power of the velocity of the air, when the air is blowing straight at the object. The effect of air velocity is much less during the falling rate period."

William H. Cady, Chief Chemist of the United States Finishing Company, then presented a paper entitled "Gas Fading of Dyes on Acetate Rayon," which appears in this issue.

The meeting adjourned at 10:15 p.m. Attendance 180.

Respectfully submitted,

LOUIS D. FLEMING, *Secretary.*

CALENDAR OF COMING EVENTS

Annual Outing, South Central Section, Lookout Mountain Hotel, Lookout Mountain, Tenn. August 4 and 5, 1939.

* * *

Annual Meeting, Boston, Mass., September 15 and 16, 1939. Headquarters: Copley-Plaza Hotel.

Gas Fading of Dyes

On Acetate Rayon*

WM. H. CADY**

BY the expression "Gas Fading" is meant the change of shade which sometimes takes place in dyed fabrics (usually at a slow rate while the goods are in storage) as a result of the action of certain gases in the air immediately surrounding the fabrics. This phenomenon has been observed for about ten years, and is confined to acetate rayon, or rather, to certain dyes on acetate rayon, particularly blues, greens and violets. During the last few months, consumer complaints of gas fading have been increasing, and there has been considerable agitation among the converters for "gas-proof" acetate colors, which can be depended upon not to fade in storage.

A writer in a recent issue of the *Daily News Record* quotes a "fabric finisher" as stating that it is difficult to estimate the total amount of goods damaged by gas fading, because it may be months before the consumer discovers it; and also because the garments actually returned because of gas fading may be only a small fraction of the garments which have faded from this cause. Furthermore, when a garment develops a change of shade, as a result of gas fading, it is often mistaken for light fading and is so reported.

In view of the increasing interest in this subject and the scarcity of articles in the American technical journals dealing with it, it seemed worth while to collect some of the facts regarding gas fading and its prevention, and to try to show, first, what is the cause of the fading; second, what dyes are affected; third, how dyes which *are* affected can be made reasonably gas-proof; and fourth, how dyed acetate fabrics can be tested in the laboratory to determine whether they are actually gas-proof or not.

First, as to the cause of the fading: Goodall[1] called attention in 1935 to the fact that when blue acetate rayon fabrics are stored or displayed in store windows, two kinds of fading are liable to take place: fading due to light, particularly under damp conditions, which is accomplished by a *reduction* in the nitrogen content of the fiber; and fading due to gas fumes, which is accompanied by a large *increase* in the nitrogen content. He pointed out further that the blue acetate rayon dyes in common use were all very sensitive to acids and could be quickly faded by exposure to sulfur dioxide gas, for example. However, he went on to say that the fading caused by sulfur dioxide was not permanent, for the original shade could be easily restored by weak alkalies, which was not the case with dyes which changed shade in storage. He next showed that the true gas fading, that is, the permanent change of shade which occurs when goods are stored for a long period of time, can be reproduced exactly "by exposure of the dyed material to the fumes from burning coal gas," and expressed his opinion that such fumes were the initial cause of the trouble; but he explained that these fumes contain not only sulfur dioxide, but also oxides of nitrogen "to the extent of six parts per 10,000 parts of coal gas burnt," and he attributed the gas fading to the action of these oxides of nitrogen.

Incidentally, the difference between the action of sulfur dioxide and nitrogen oxides on blue acetate dyeings is easily demonstrated by treating dyeings with sulfurous acid and nitrous acid, respectively. In both cases the shade is altered, but on neutralization with ammonia, the dyeings treated with sulfurous acid recover their original shades, while those treated with nitrous acid are permanently faded.

The fact that dyed acetate rayon fabrics which faded when exposed to coal gas fumes showed an increase in their nitrogen content (from four to eight times the original amount) was considered by Goodall to be further proof that the nitrogen oxides were the cause of the fading. Incidentally, he stated that these oxides react not only with the dyes but with the acetate rayon fiber itself, converting it partly into cellulose nitrate.

It is interesting to note from Goodall's paper that the oxides of nitrogen are not products of combustion of the coal gas itself, but apparently are produced by oxidation of atmospheric nitrogen in the heat of the gas flame. Even with an electric heater, he was able to produce similar effects.

In a private communication received by the writer, a representative of one of the large dye firms described two investigations of gas fading which he personally made several years ago. He visited a Philadelphia clothing factory, on the top floor of which several thousand men's suits were stored. On examination, he found that practically all the suits which were lined with acetate rayon showed a "very bad alteration of shade, particularly in the gray and tan linings." On looking around for the cause of the trouble, he discovered that on the next floor below, about two hundred gas irons were used for hot pressing

*Presented before the R. I. Section, April 28, 1939.
**U. S. Finishing Co., Inc.

of the garments, and that "there was ample access to the top floor for the fumes to travel through." In another similar complaint, this time in a men's clothing store in New York, he found that the trouble "seemed to originate from an oil burner heating plant underneath the store."

As to the actual chemical changes which take place in the dyes under the influence of gas fumes, we are indebted to Rowe and Chamberlain[2], who made an exhaustive study of the reactions involved, and published a monumental report in the *Journal of the Society of Dyers and Colourists* in 1937. They first pointed out that all the commercial acetate rayon dyes which are derived from anthraquinone are basic; in other words, they possess from one to as many as four amino groups, and there seems to be some connection between the degree of basicity of the dye and its sensitiveness to gas fumes, although there are other contributory factors, as will be explained later. They stated that the chemical change which the dye undergoes in gas fading may be a diazotization, a nitrosation, or an oxidation, depending on the particular dyestuff involved.

The experimental work on which the findings of Rowe and Chamberlain are based is described in great detail in their report. They obtained samples of eighteen anthraquinonoid acetate rayon dyes of which the constitutions were known, and which produced shades of orange, red, violet, blue and green. Dyeings of these eighteen dyes were exposed to the fumes from a gas burner for 80 hours, during which time most of the dyeings were completely altered in shade. An attempt was then made to extract the altered dyes from the fiber and analyze them, but without success, as they were too badly decomposed. Also, the experiment was tried of making suspensions of the dyes in water and passing burnt gas fumes through for 80 hours, but the action of the gas was too slow to be of any service. Finally, the fumes of nitrous acid, made from sodium nitrite and sulfuric acid, were substituted for the burnt gas fumes. When these were aspirated through water suspensions of the 18 dyes for ½ hour, and the dyes were subsequently filtered off and analyzed, in most cases there was found definite evidence of diazotization or nitrosamine formation.

To prove conclusively that it was the nitrogen oxides in the burnt gas which furnished the active principle in gas fading, Rowe and Chamberlain washed the burnt gas fumes with suitable reagents in order to remove the oxide of nitrogen completely, and demonstrated that no fading occurred.

However, they observed that the fading from burnt gas fumes was not exactly duplicated by the oxides of nitrogen produced artificially from nitrite of soda and sulfuric acid. This they suspected was due to the influence of the sulfur dioxide and trioxide in the burnt gas fumes. They, therefore, conducted further experiments with controlled quantities of sodium nitrite, sodium bisulfite and sulfuric acid, and obtained results approaching the effect of burnt gas fumes. This method of testing dyes is rapid and easy to perform, and will be referred to later in more detail.

It should be noted in passing that the same acetate rayon dyes applied to wool and exposed to gas fumes are little affected, according to Rowe and Chamberlain, indicating that the wool itself absorbs the oxides of nitrogen and so protects the dyes from attack.

We now come to the next question: what dyes are affected by the gas fumes? Without any attempt to give titles and manufacturers' names, it may be stated that practically every direct dyeing acetate rayon blue, green and violet derived from anthraquinone is extremely sensitive to gas fading, and in a less degree the same is true of the reds. Since there are no blue, green and violet dyes now in use which are not anthraquinone derivatives, it may be fairly stated that there are no dyes available at the present time capable of producing these shades which are gas-proof. True, there are one or two blue dyes which were recently offered by their manufacturers as being satisfactory in this respect, but, unfortunately, their dyeing properties are distinctly below par.

It should be remembered that all the dyes which have been so far discussed belong to the anthraquinonoid family, but there are also a considerable number of acetate rayon dyes which are azo compounds, including most of the yellows, oranges and reds. For the most part, these dyes are not materially affected by gas fumes. There should also be included in this group the shades produced on acetate rayon (mainly wine, navy and black) by diazotizing certain bases and developing beta oxy naphthoic acid. These are also immune to attack by gas fumes.

To sum up the situation, we have dyes reasonably fast to gas fading covering about one-half of the spectrum. The other half is extremely vulnerable. For mode shades, tans, grays, browns, etc., which require several dyes, including blue, there is no satisfactory combination which will withstand the gas.

This leads us to the next question: how can dyes which are affected by gas fumes be made reasonably gas-proof? This matter has received much attention from both producers and consumers of dyes during the last year, and a number of remedies have been proposed. Perhaps the best known of these is sodium thiosulfate, the use of which as an aftertreatment to prevent gas fading was patented[3] in 1937. Earlier, patents were issued covering the use of urea and several of its derivatives[4], and even such complex substances as benzyl ethyl aniline[5]. Borax and soap have also been proposed. Presumably the action of all of these substances is based on their ability to absorb the oxides of nitrogen in preference to their being absorbed by the dyes. In all cases, according to the writer's experience, the protection which they afford gradually breaks down on prolonged exposure to the fumes, and the best that can be said of them is that they will probably take care of any ordinary storage conditions, but are definitely "without guarantee."

Even if no protective chemicals are put on the fabric after dyeing to prevent gas fading, there remains the possibility that the regular finishing agents which are used to impart the necessary "hand" to the fabric may have an effect of their own on the fading, which may be beneficial or the opposite. Rowe and Chamberlain stated that basic finishing agents accelerate the fading action of burnt gas fumes, and the writer has found this to be the case with at least one well-known softener. Copper sulfate likewise has an accelerating action. Practically nothing has been published on this subject, and additional information is badly needed.

We come now to the final question: how can dyed acetate fabrics be tested in the laboratory to determine whether they are actually gas-proof? Rowe and Chamberlain suggested a simple method which has already been referred to. A 10 per cent dyeing was immersed in a mixture of 10 cc. N/10 sodium nitrite and 10 cc. N/10 sodium bisulfite, and a measured volume of N/10 sulfuric acid was added. The sample was immersed in this solution for 15 minutes and was then removed and compared with the original. Then the test was repeated with a fresh sample, using more acid, and so on until it had been determined how much acid was necessary to produce a visible effect on the shade, and to destroy it completely. The greater the amount of acid required, the more stable the dye might be expected to be to gas fumes. As previously mentioned, this method gives results approaching those obtained from gas fumes, but it has its limitations and was recommended by Rowe and Chamberlain principally as a rapid preliminary test.

A still simpler method of testing is to suspend a dyeing just below the top of a tall graduate, at the bottom of which is a solution of sodium nitrite and sulfuric acid. As the nitrous acid gas rises, the shade of the dyeing can be seen to change visibly. This method, however, is not to be depended upon for accurate work.

To imitate actual gas fading, such as occurs in storage, the method most commonly used today is to allow the products of combustion from a lighted gas burner to flow through a large metal pipe or box in which are hung samples of the dyed fabrics to be tested. No statistics are available as to the volume of illuminating gas which is required for any given period of time. Experience shows that desirable results are obtained if the temperature of the fading chamber is maintained at approximately 50° C. by regulating the flow of gas. At lower temperatures, the fading action is slower. While no standards of fastness have yet been formulated by the industry, one of the commercial testing laboratories has adopted an arbitrary unit of 16 hours of exposure to the fumes from a lighted Bunsen burner, and any dyeing which will survive two, or perhaps three, of these units without appreciable change of shade is classed as good. The writer has found it difficult to obtain exactly duplicate results on two different days; the fading requiring only 18 hours of exposure one day may require over 24 hours on another occasion. In order to control this condition, it is advisable to hang in the fume chamber, in addition to the samples to be tested, a strip of some standard blue dyeing which is known to be very sensitive to gas fumes, and to watch this strip until it has faded to a predetermined end point, usually a dull reddish violet (this ordinarily requires about 24 hours), after which the standard sample is removed and a new one is inserted. In this way, a definite "unit" of fading can be set up which is reasonably reproducible.

It must be admitted, however, that even such a test as this is not a guarantee against excessive gas fading. Who can anticipate what the atmospheric conditions will be in a storehouse, a garment factory, a tailoring establishment, a laundry, or even in the home? In the writer's opinion, the problem of gas fading will not be solved until new dyes have been produced which are not vulnerable to the oxides of nitrogen. This should be an interesting project for the research chemist.

References

[1]J. Soc. Dyers & Col. *51*, 126 (1935).
[2]J. Soc. Dyers & Col. *53*, 268 (1937).
[3]E. P. 460,027.
[4]E. P. 373,628; 406,653.
[5]E. P. 361,362.

Annual Meeting and Convention September 15 and 16 Boston, Massachusetts

A Discussion of the

Metachrome Method of Dyeing*

C. H. A. SCHMITT**

THE Metachrome method of dyeing was originated in 1900. In fact, the Berlin Aniline Works were issued a patent on the process at that time dealing with the use of a special mordant called Metachrome Mordant. It would seem that in a period of 38 years everything would be known about the process, but on the contrary there are many who have lost sight of the advantages of the process, as well as the technical aspects and proper handling.

The fact that the advantages of the Metachrome process were being sadly neglected was brought very clearly to my mind during the past year. In my various travels around the country I was amazed at the difference of opinion as to the value of the Metachrome process. On one hand I found many dyers and chemists who were firm believers in this method of dyeing, on the other hand I was also greatly amazed to hear the various opinions expressed by others. Their reasons for not using the Metachrome process were many and in nearly every case poorly founded. This is what prompted me to prepare this paper.

Before going into the technology of Metachrome dyeing and its advantages, let us first deal with the opposition which seems to have prevailed for years among the dyeing fraternity. Generally speaking, this opposition is built around three facts:

1. The cost of dyeing heavy shades.
2. The question of fastness.
3. The false idea that there are not sufficient colors for the Metachrome method.

The cost of dyeing heavy shades—This is a point which we might as well agree on right now. It is impossible to dye heavy shades as economically Metachrome as can be done Top Chrome. There is nothing that will equal the cheapness of blacks or navies dyed with Black T or Chrome Blue Black by the Top Chrome method. For heavy browns it is impossible to obtain anything that will equal the low cost of dyeing of Brown EB, Brown BC, or Brown RH, Top Chrome, assuming that these colors meet the necessary requirements.

Now for opposition points No. 2 and No. 3—I will take these both up together as I am quite sure that the question of fastness in many cases can be tied up with the question of suitable colors.

*Presented at meeting, Northern New England Section, April 7, 1939.

**Sandoz Chemical Works, Inc.

COMPARISON OF FASTNESS PROPERTIES DYED METACHROME vs. TOP CHROME

Many dyers and chemists have avoided the use of the Metachrome process because they claim they cannot obtain the necessary fastness. If we go back ten or fifteen years we can understand why certain individuals held this point. It was true that with a limited number of dyestuffs it was rather difficult to find colors which would dye Metachrome and meet the necessary fastness requirements. The number of chrome colors was a great deal smaller than what we have available today. Of the small number of chrome colors that were available at that time there were very few that could be properly called Metachrome, or at least working satisfactorily by the Metachrome method. Many of the colors, no doubt, were tried out by the Metachrome method and found to be inferior in fastness, as when compared to the Top Chrome method. It is possible, however, that many times a color was thrown down as a Metachrome color simply because it was not quite as fast as Top Chrome; on the other hand, it was entirely fast enough to meet the requirements of the goods for which it was to be used.

In a good many instances the fact that the comparative test showed the color somewhat less fast Metachrome than Top Chrome was traceable to the fact that the color tested should never have been dyed Metachrome in the first place. A good many colors are used in a Metachrome bath in order to obtain fastness to light, but by this method their fastness to fulling is admittedly weak. A good Metachrome color should give equal fastness Metachrome as Top Chrome.

The false impression that Metachrome dyeing did not give sufficient fastness to fulling did not keep many dyers from using this process for their light shades. While many of the colors in the past were fast enough to fulling in the light shades they did not always satisfy the customer in regards fastness to light and for this reason the method was further neglected.

Another point which destroyed the confidence of dyers in the use of the Metachrome process resulted from the poor fastness which was directly attributed to a most important point—the improper dyeing formula. Most of the dyestuff companies have gone to great length to explain the true Metachrome method of dyeing, as well as the modified methods to be used with certain dyestuffs.

Dyestuffs are like people, no two are alike, although there are many which can be grouped together and treated alike. I will take up this matter in a few minutes under the heading of "Correct Metachrome Methods."

However, admitting that the opposition have had an argument in years gone by that there have been a lack of suitable dyestuffs or colors of suitable fastness, let us consider recent developments and discoveries of chrome colors in recent years.

In the last few years there has been a steady increasing number of new chrome colors patented and placed on the market. A goodly portion of these new chrome dyestuffs have been outstanding in their suitability for the Metachrome method. Not only have some of the new chrome colors been far superior in their working properties to many of the old line of chrome colors, but their fastness by the Metachrome method has also been outstanding. In fact, many of the new chrome colors, by actual comparative tests, equal the Top Chrome fastness on most points. Here and there the fastness may be one-half a number less. As regards the few cases where the color is one-half a point less fast by the Metachrome method, we can only answer this point by saying that regardless of this fact and with this decreased fastness they are still of sufficient fastness to meet all practical requirements.

For instance, Alizarine Black B rates only 3 to 4 to potting by the Metachrome process and 4 by the Top Chrome, and I believe it safe to say that there are plenty of goods dyed with Alizarine Black B by the Metachrome process that are potted. If dyers and chemists only made a comparison of the color Metachrome vs. Top Chrome they probably would not use it. The same comparison exists with Alizarine Black B as regards its fastness to fulling Top Chrome or Metachrome, yet Alizarine Black B is one of the popular colors for Metachrome work.

Take our old friend, Brown EB, one of the most popular colors in the past for Metachrome dyeing, even though I don't entirely agree on its suitability for the process. I have checked carefully the fastness of this color to all the popular requirements both Top Chrome and Metachrome and what differences do I find—Brown EB dyed Metachrome has a fastness to washing at 175° F. of 4 to 5 versus white wool; whereas when dyed Top Chrome it has a fastness of 5. Now who is going to wash woolens at 175° F.? The only other point of difference comes under the question of rubbing—Brown EB is rated 4 Top Chrome—Metachrome 3 to 4. In spite of this slight difference there has been tons of this color dyed Metachrome.

To those individuals who feel that the only proper fastness to wet finishing comes about by the use of the Top Chrome method, they might be interested to know that some of the common types like Alizarine Orange R and Chrome Yellow 3G and 5G are actually faster in many ways dyed Metachrome than Top Chrome.

In piece dye mills where the Metachrome method was much desired, further limits were placed on this process because many of the colors used were not truly Metachrome colors and the excessive amount of acid required to exhaust them quite often gave trouble from streakiness. In the dyeing of pieces with Metachrome colors, it is most desirable to use dyestuffs that will exhaust with a normal amount of acid as prescribed for the method or will exhaust with what acetic acid there is present in the ammonium acetate with which the bath is started.

In the two most important fastness requirements, light and fulling, we now have a group of new colors which have unsurpassed fastness to light and fulling when dyed Metachrome:

Metomega Chrome Red GM
Metomega Chrome Brown 3GL Pat.
Metomega Chrome Orange ML
Metomega Chrome Yellow ME
Metomega Chrome Blue 2BL Conc.
Metomega Chrome Brown RLL Pat.
Omega Chrome Fast Green G
Omega Chrome Black Blue G

These new colors, even when dyed in very light shades, have excellent fastness to light whether dyed Chrome Mordant, Top Chrome or Chromate. In fastness to fulling they will meet any practical requirement, even when dyed in heavy shades. Let me reiterate that these new chrome colors are equally as fast dyed Metachrome as when dyed Top Chrome.

As a matter of completion let me state that there is a small group of acid colors of sufficient fastness to light and other requirements for men's wear which can be used along with the above mentioned Metomega colors.

Brilliant Alizarine Milling Blue G
Brilliant Alizarine Milling Blue BL Pat.
Alizarine Milling Blue SL
Alizarine Light Brown BL

CORRECT METACHROME METHODS

This brings us to the question of what is the proper way of dyeing chrome colors with chrome in the bath at the beginning of the process. Perhaps it might be worth while to go into the chemistry of Metachrome dyeing. As you all know, the patent granted the Berlin Company in 1900 called for a special mordant, called Metachrome Mordant. This Mordant, as you well know, consisted of a mixture of potassium chromate and ammonium sulfate. As the dye liquor boils the sulfuric acid present in the ammonium sulfate combines with the potassium chromate converting it into bichromate, which acts on the dyestuff and fixes it within the fiber in the form of a chrome lake. Some colors require a very small amount of acetic acid to exhaust the bath, which is preferably added after ½-¾ hour of boiling. By far and the best method to follow and one particularly recommended for piece goods is to add 4-6 per cent ammonium acetate to the dyebath in the beginning, along with the

Metachrome Mordant. The chemistry of the dyebath is the same as previously stated. The sulfuric acid converts the chromate into bichromate at the same time the ammonia in the ammonium acetate goes off permitting the acetic acid to assist in the exhaustion of the bath.

Generally speaking, it is recommended to use twice as much Metachrome Mordant as color, but never going below 2 per cent or more than 6 per cent. The reason for recommending no less than 2 per cent is because you must consider that the wool itself will absorb a percentage of the chrome and if an insufficient amount is added there will not be enough available for the conversion of the dyestuff into the chrome lake. 1¼ hours' boiling is usually sufficient.

SHADING IN A METACHROME BATH

Due to the fact that shade begins to develop so much quicker by the Metachrome method, it is possible to shade at a very much earlier period with a great saving in time over the Top Chrome method. It is generally best to shut off the steam and cool down to 170° F., although after a dyer knows his colors this can be done at 190° F. Colors recommended for feeding or shading are:

Omega Chrome Brown EB
Brilliant Alizarine Light Violet FFR Pat.
Brilliant Alizarine Sky Blue BS
Omega Chrome Aurine GL
Alizarine Light Violet 2RC
Xylene Milling Blue BL
Xylene Blue AS
Sulfonine Red G

or any of the acetic acid dyeing colors which level well, are not dulled by chrome and have sufficient fastness to light, fulling, perspiration and other necessary requirements. Other chrome colors may be used for shading provided they are of the slow exhausting type, level well and are not precipitated by free chrome.

DYEING OF PULLED OR TIPPY WOOL

In the dyeing of pulled wool, especially that which is removed from the skin by the use of lime, it is necessary to use larger amounts of acid to overcome the alkalinity of the lime which retards the development of the shade. The majority of chrome colors dye very mottley and tippy by the Metachrome process on pulled wool. Because of their slow exhaustion and the added alkalinity of the bath some very horrible effects can be obtained. By the use of proper dyestuffs, particularly these new chrome colors which exhaust with a minimum amount of acid, it is possible to dye this tippy wool perfectly level. In fact, the slight amount of alkali present in some of these tippy wools even helps these new colors to dye perfect, whereas it is so detrimental to many colors. It is a strange coincidence that this type of wool can be dyed level by a number of certain fast exhausting acid colors, yet which if they were applied to piece goods would be extremely uneven and poorly penetrated because of the quick exhaustion.

EXCELLENT PENETRATING QUALITIES OF THESE FAST EXHAUSTING COLORS

While a number of our new chrome colors will exhaust rapidly and dye perfectly level on tippy wools, they do not follow the habit of the acid colors of which I just spoke, in fact, some of the tightest woven gabardine pieces have been dyed perfectly level and thoroughly penetrated with these same fast exhausting Metomega colors. I have recently seen shades all the way from light greys right up through to medium navy shades dyed perfectly level on these fabrics. In piece dyeing with this type of color we follow the same procedure and amounts of Glauber's salt, Metachrome Mordant and acetate of ammonia. On some shades the dyer might make up his own acetate of ammonia, leaning a little bit heavily on the alkaline side for some shades, whereas on others he might use a little bit more acetic acid.

MACHINE DYEING

In the dyeing of yarn, tops or stock, in pressure machines the same general formula is suggested, except that it is often found advantageous to start dyeing slightly on the alkaline side. In other words, exhaustion is easier and quicker in the machine than in an open kettle.

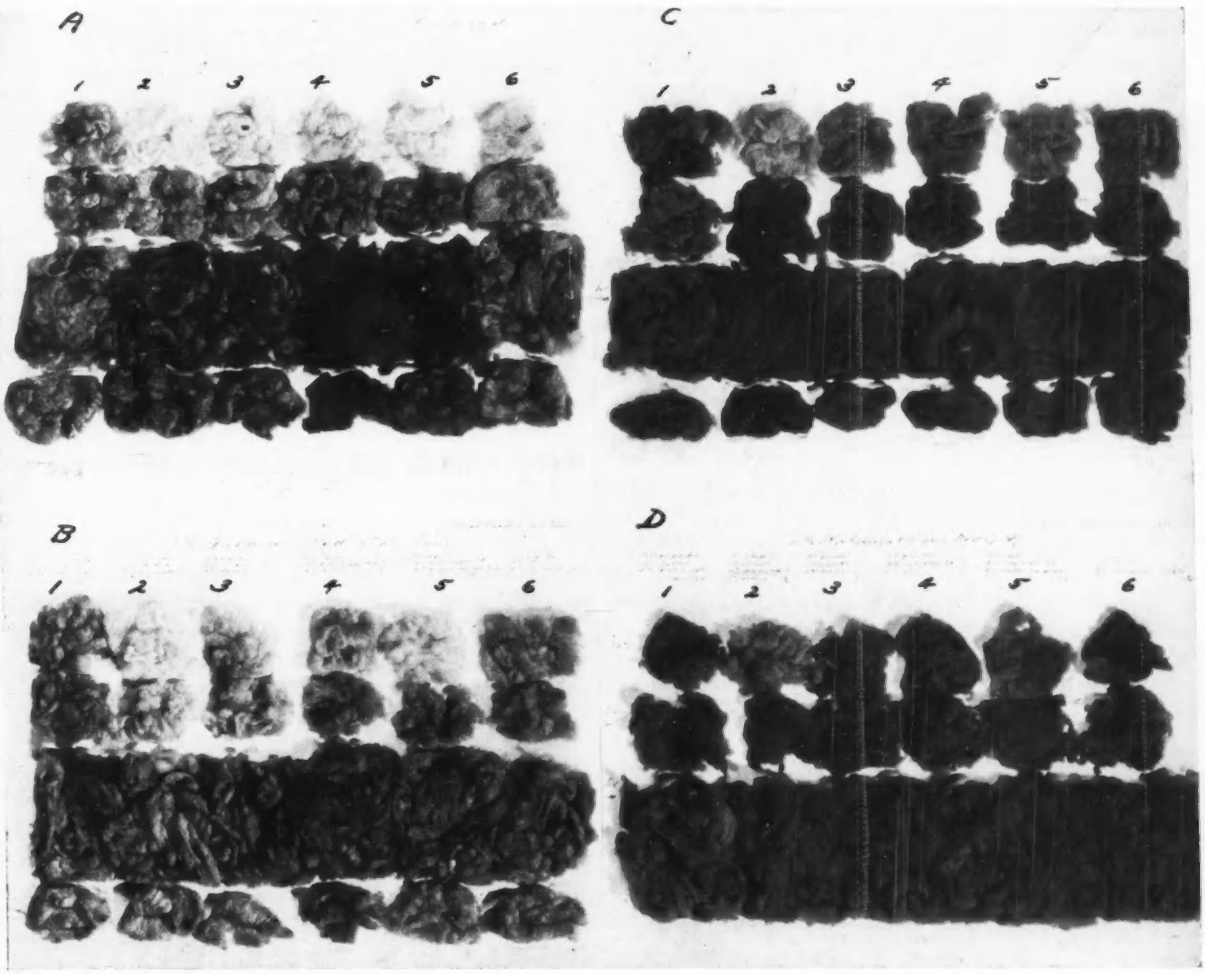
Additions can be made to a Metachrome bath up to 4 ounces of color per 100 pounds of material without lowering the temperature or adding any more Metachrome. The dye should be dissolved, well diluted and added carefully. For larger additions, particularly in Franklin package machines, it is a good idea to drain off the dye and start over.

MODIFIED FORMS OF THE METACHROME PROCESS

This is a good time to point out the troubles that occurred when dyers have tried to replace Metachrome Mordant with bichrome. I do not mean to infer that this cannot be done, but there are other things to consider when you use bichrome. If the Metachrome Mordant is replaced with bichrome a number of dyestuffs will precipitate as the chrome lake right in the bath. The acid drives this on to the fiber and the result is that this surface dyeing is the beginning of many troubles. In the first place, the color will crock and in the second place, it will full off and stain white fibers badly.

I distinctly remember two occasions in different mills where I was called in to find out why their white wool was staining in the fulling. On calling for the dyehouse formula I found that the dyer had used Glauber's salt, sodium bichromate and acetic acid. When I arrived in the dyehouse he had a kettle ready to dye by this same formlla and saw no reason for not going ahead with it, as he had dyed many colors in this fashion with no harmful results.

I was given permission to start a kettle right next to his, dyeing the color as I believed it should have been dyed, that is, with Glauber's salt, Metachrome Mordant and acetate of ammonia. I had a very good chance to



The above photograph shows a few of the many comparisons the speaker displayed, illustrating the fact that true metachrome dyeing colors work well by all forms of chromate dyeing, producing level as well as fast results; whereas poorly selected dyestuffs produced mottled results (tippy dyeing) as well as poor fulling fastness.

A—Alizarine Red S—Dyed on pulled wool.

B—Alizarine Red S—Dyed on fine Territory wool.

C—Metomega Chrome Red GM—Dyed on pulled wool.

D—Metomega Chrome Red GM—Dyed on fine Territory wool.

In each group of dyeings there appear 4 rows of swatches and a 5th row of small pieces of cloth. These are as follows:

Top row—Samples taken from dyeing bath at 190° F.

2nd Row—Samples taken from dyebath after boiling ½ hour.

3rd row—Final dyeing after 1¼ hour boiling.

4th row—1½ hour Launder-Ometer fulling tests.

5th row—Samples of white test cloth present in the fulling test.

In each of the 4 groups, dyeings were carried out as follows:

No. 1—10% Calcined Glauber's salt.
1% Sodium Bichromate.
5% Acetic Acid 28%. Boil 1½ hours.

No. 2—10% Calcined Glauber's salt.
1% Sodium Bichromate.
3% Ammonia. Boil ½ hour.
Add 5% Acetic Acid 28%. Boil ¾ hour.

No. 3—10% Calcined Glauber's salt.
1% Chrome. Boil ½ hour.
Add 5% Acetic Acid 28%. Boil ¾ hour.

No. 4—10% Calcined Glauber's salt.
4% Metachrome Mordant. Boil ½ hour.
Add 4% Acetic Acid 28%. Boil ¾ hour.

No. 5—10% Calcined Glauber's salt.
4% Metachrome Mordant.
6% Ammonia Acetate. Boil 1¼ hours.

No. 6—10% Calcined Glauber's salt.
1% Sodium Bichromate.
3% Ammonium Sulfate. Boil 1¼ hours.

On the left (Group A and B)—These indicate that Alizarine Red S (like many other poorly selected chrome colors) will not dye properly by any of the popular forms of metachrome dyeing, either on a fine territory or a pulled wool. Stock is part red and part undyed. Furthermore, the fastness to fulling is poor (staining of white wool and silk does not show up very well in photograph).

Contrast the results obtained by a true metachrome dyeing dyestuff, as shown by the Groups C and D on the right. Dyeing and development of the true shade begins at 190° F., and is well developed after ½ hour boil. Dyeing is extremely level on all parts of the wool, producing a solid shade, all of which occurs under any form of metachrome dyeing, or on any type of wool. (Color used was Metomega Chrome Red GM.)

show this man what actually was taking place. My dyebath was a good clear brown solution from the start right up to the time when exhaustion set in. His dyebath began to appear murky as soon as the temperature was raised and looked quite muddy for most of the dyeing period, although it did finally exhaust. A handful of stock was taken from each kettle and put in a bag in a fulling mill. Needless to say the proper method of Metachrome dyeing for the color in question was decided then and there, because the color dyed with chrome and acid fulled down considerably and stained his white wool noticeably, whereas my batch, being properly dyed, was perfectly fast in every way.

At another time a mill complained that their brown was fulling off badly, in fact would not even stand hand soaping in warm water. A few laboratory dyeings showed them very quickly where their trouble was. The free chrome was precipitating the color loosely on the fiber and naturally was not fast to fulling.

If a mill does not want to buy Metachrome Mordant and yet the dyer wants to use this method, regular bichrome can be used, but the proper dyestuffs must also be chosen. It is also necessary that the bichrome be made alkaline with ammonia. Even if he uses ammonium sulfate with bichrome it will be necessary with many colors to make the bath alkaline. For each 1 pound of bichrome it requires 2½ pounds of ammonium sulfate. If bichrome is used the acid should be added to the bath after it has boiled for at least ½ hour. Another point which seems hardly necessary to mention, is that the dyestuff and bichrome should never be dissolved together because this is the easiest way to start precipitation of many colors.

I have already referred to a precipitation which takes place with some dyestuffs and the trouble encountered because of it. In machine dyeing it is particularly dangerous to try and use bichrome unless you are sure that you have made it properly alkaline. In fact, authorities on this subject advise circulation of the dye liquor at the boil for at least ¼ of an hour before the bichrome is added with the ammonia. By using Metachrome Mordant and ammonium acetate no extraordinary care is necessary.

Generally speaking, modified forms of the true Metachrome process, as I have already outlined it, are not at all dangerous and can cause no trouble if true Metachrome dyestuffs are used. The danger comes, of course, when colors of unknown Metachrome dyeing properties are used. It is safe to say that a real true Metachrome color or a Metachrome dyeing color will work well no matter what form of Metachrome process is employed.

I have here a series of cards showing various dyestuffs dyed up by six different Metachrome methods; these indicate that a true Metachrome color works uniformly by any of the various modified methods. Other colors only produce satisfactory results when dyed with Metachrome and ammonium acetate or ammonia only. Other dyestuffs will not dye properly no matter what form of the method is used. You will note that certain colors, such as Alizarine Red, while they may dye to some extent by the neutral Metachrome method or with a small amount of acetic acid for exhaustion, they do not have good fastness to fulling. Colors like Alizarine Red will not dye fast to fulling by any of the modified forms, whereas a strict Metachrome color, like Metomega Chrome Red GM, will dye perfectly level, full strength and give excellent fastness to fulling under any method of Metachrome dyeing. The new line of colors which I have been occasionally referring to, which have been brought out within the last year or two, are in this same class, in that you just cannot keep them from dyeing properly and having excellent fastness. It does not matter whether you dye them with neutral Metachrome Mordant, or with straight bichrome in the bath, or with chrome and ammonium sulfate, or with chrome and ammonia you will get good results under every condition.

If any of you are interested in dyeing your shades by the Metachrome method do not attempt to use any chrome dyestuff that you happen to lay your hands on, but pick that group of colors which the various manufacturers recommend for the work; only in this way can you be assured of obtaining level results whether it be piece, stock, slub or yarn dyeing, and at the same time obtain maximum fastness. By the right choice of colors you can obtain just as excellent fastness to every requirement that you can when you dye them Top Chrome.

For making converts, or interesting dyers in the Metachrome process I will sum up my talk by stating that the old argument that fast enough results could not be obtained by this process, is antiquated, and that today we have a sufficiently complete line of chrome dyestuffs which will give all the necessary fastness requirements when dyed by the Metachrome method.

If we agree that there are now a sufficient line of fast colors for this process, what are the advantages? These are summed up as follows:

1. The dyeing time is shorter, particularly when establishing formulae for new shades.
2. Matching of shades is much simpler because of the steady development of the shade from almost the beginning of the dyeing process, as compared with the delay in matching of shade by the Top Chrome method.
3. The greater use of metals in dyeing machinery gives dyers further concern when working with the Top Chrome method. The change of shade by metals is materially overcome and in many cases eliminated by dyeing by the Metachrome process.

In conclusion, if any of you are skeptical or unfamiliar with Metachrome dyeing, I suggest that you dye a few of your light shades by the Metachrome process, using colors of recognized suitability. Once you have dyed a few

shades in this manner and satisfied yourselves that the shades you have produced are just as fast as when you dyed them Top Chrome, then go ahead and try them on your medium shades. It won't be long before you will begin to appreciate the advantages of the Metachrome Method.

Aridye Process of Printing*

NORMAN S. CASSELL**

LOOKING at the advertisements and illustrations in magazines of today, one is impressed by the beauty of the modern printer's art. The delicate shading, the exquisite coloring, the fidelity of reproduction show the great strides that have been made in this art in recent years. Every textile printer, I am sure, in observing these prints, has reacted by wondering if it will ever be possible to print fabrics with such a high degree of perfection. Perhaps, too, a few have had the opportunity of looking in on the printing of these magazines where huge presses purr along at 1,000 to 1,500 feet per minute, and have contrasted this speed with the relatively plodding speed of textile printing presses.

The fundamentals underlying rotogravure paper printing and textile printing are the same: namely a surface, an engraved cylinder, and a printing or coloring medium. Papers can be coarse and porous, or hard and glazed. Cotton fabrics correspond to the former, while an acetate satin would be like the latter.

Cylinders for paper printing have a shallow engraving, while those for fabric are generally rather deep. The real difference, however, comes in the coloring medium. As you know, dyes are thickened with water soluble gums or starches which form a pseudo-plastic medium, not a particularly good printing medium, and one which requires a rather deep engraving that is not suitable for printing fine shadings. Paper printing inks are organic solvent solutions of resinous materials in which pigments have been dispersed. These possess a physical state whose characteristics make possible the printing of fine engravings at high speeds.

The thought of printing fabric with a medium possessing these same desirable characteristics was a logical one for the Research Laboratories of Interchemical Corporation, since the application of color to all surfaces is the basic interest of this company. The problem of applying color to a fabric so that it will resist the abuse of repeated launderings was not, however, a simple one. It is, nevertheless, an accomplished fact today.

A number of technical developments contributed to the successful achievement of this formulation. One of these is the amazing development of the field of synthetic resins. These have been coming to the market in a continual stream, with a great variety of properties. During the past year the vehicle division of our laboratories examined and classified over a hundred new synthetic resins. It is now possible to obtain resins which will so adhere to the cellulose fiber as to be virtually a part of that fiber. In fact, resins can be selected which are more resistant than the fibers themselves. The selection of the proper combination of resins to give the necessary fastness was made only after systematic exhaustive tests.

Another important development is that of permanent pigments. The coloring matters used in paper printing inks, although for the most part very light fast, generally do not possess the necessary resistance to alkalinity, soaping, perspiration, deodorants, etc. The further development of pigments has proceeded steadily in recent years, and from the many available we have chosen those which stand our severe tests. Some of the pigments used are the finest vat colors. Others have been developed especially to meet our needs. The stimulus of this new application will result, no doubt, in many new, fast and brilliant colors. Some of those recently developed have fastness greatly exceeding the well known fast dyes. Imagine a pale blue or aqua which will stand 300 hours in the Fade-Ometer with no change.

A third vital contribution is in the science of dispersion. The involved physics of dispersing insoluble color into the resins so that each minute particle of color is surrounded by resin calls for most careful control. Each color is a problem in itself and must have its own set of physical and chemical conditions.

The formulation called Aridye, in use today for the printing of fabric, is the result of intensive research in applying the aforementioned developments. It combines the desirable printing properties of the finest paper rotogravure inks with the extreme fastness required for the printing of cottons. As evidence that such is a fact, existing rollers employed in printing a magazine advertisement, were used to print on various fabrics with Aridye as the coloring medium. Here is a current magazine, on the back cover of which is the Chesterfield advertisement of Magnolia Gardens. If you will compare the printing on paper with that on the fabric I think you will agree with me that if anything the fabric is the better job.

*Presented at meeting, Rhode Island Section, Jan. 27, 1939 and Piedmont Section, Feb. 11, 1939.

**Vice president, Aridye Corp.

Then, here you will note strips have been cut out, submitted to one hour boiling soap wash, as well as dry-cleaning, then placed back into their original place. You will note that no let-down in color occurred. Again as further proof of printing quality we submit these prints on various fabrics of a well-known movie actress, showing the perfect shading and fidelity of reproduction. I would like to repeat again that these were printed from the original engravings for paper.

Let us consider the practical application of Aridye printing paste in the mill and what it does for the printer, the colorist, and the finisher.

The nature of the medium is such that it wets metals readily, hence the engraving is instantly furnished, including the finest pins. Then too, since it wets the fiber with equal ease, it transfers to the fabric at the instant of contact, giving a perfect print with a minimum of pressure. These factors make for sound, even printing at high speeds, with the least wear and tear on the machine, as well as reduced power consumption.

Because it is a positive, visible print, defects can be seen readily by the printer, thus reducing the percentage of seconds. The colorist, of course, receives a very tangible benefit in that the finished shade is apparent in the brief interval it takes to dry a patch on the can. A good approximation of shade is obtained by a finger spot, and then since it takes but a few minutes to pull a patch and dry it, necessary changes are quickly made. You can readily see the amount of machine time which can be saved in a day.

This printing medium possesses an important quality which makes possible the production of a mark almost identical with the engraving. The color on contacting the fiber has little or no side-flush, consequently a very sharp mark obtains. In printing from mill-and-die engravings and from photographic engravings this is, of course, a real contribution.

The aftertreatment of Aridye is very simple and positive, namely sufficient heat and time to thoroughly remove the solvents. If ultimate fastness to washing is desired, the fabric should be heated to 300° F. for two to three minutes. Much of this fastness, however, is obtained in the relatively short interval of heating incident to the normal finishing operations, as in an enclosed tenter operating at 250-300° F.

Since this brief after-treatment has no bearing upon the shade, the variations that sometimes occur in ageing and soaping dyes are not encountered with Aridye.

A good range of Aridye colors is available for printing shirts, shorts, and pajamas. For printing of dress goods it is economical to print deep wines, navies, and bright reds with salt colors. The brilliance of the Aridye yellows, greens and blues makes an excellent complement to the salt colors, and a very considerable amount of color is being used for this purpose. These colors run well with acid-age colors, as well as on naphthol-prepare grounds. As the field of permanent pigments is broadened, the use of this formulation in dress goods printing will increase.

At this point a word on wash fastness of Aridye colors might be mentioned. Close cooperation with the American Institute of Laundering, U. S. Testing Company, and the Better Fabrics Bureau has enabled us to measure our progress in fastness. Our new shirting line after being tested for twenty launderings, light, perspiration, deodorants and fusing has received the A.I.L. seal of approval.

In closing let me say that it is our hope that Aridye colors will improve the quality, beauty and fastness of fabric prints, and that they will give the designer a new medium for styling. If we accomplish this we will have done a constructive job for the textile printing industry.

DISCUSSION

Rhode Island Section Meeting

Q. Does any stiffness take place with the use of this resin?

A. When using a very heavy grade there is a slight build-up which breaks down very readily but, particularly in the case of cotton, it is actually an improvement.

Q. How long do colors take to dry?

A. They are perfectly dry when they leave the cans.

Q. What types of colors are used?

A. The type of pigment must first of all be very permanent and resistant to alkalies, acid, perspiration, deodorants, etc. There are very few pigments in the inorganic field which will come up to these specifications, so in most cases pigments had to be developed for this purpose with the exception, of course, of the use of considerable quantities of vat colors.

Q. Have you confined yourselves to printing?

A. We are now seriously considering the dyeing field.

Q. Can you use the same type of pigment on cotton, spun rayon, or silk, or is there a different type for each type of cloth?

A. As you get into the field of synthetic fabrics it is important not to affect the actual hand. It can be used on cotton, rayon, or spun rayon but we have not done much pigmented rayon because it affects the hand. The printing of cellulose acetate requires a different formulation.

Q. Does this formulation froth?

A. It does not.

DISCUSSION

Piedmont Section Meeting

Q. Regarding the wash tests made by the American Institute of Laundering, were the colors tested with both soap and chlorine?

A. Yes.

Q. What temperature was employed?

A. 140° F.

Q. Have you tested them at higher temperatures, say 185°?

A. We have tested at the boil and found them equally fast.

Q. Have formulations been developed for printing on other fibers such as wool, or rayon?

A. The cotton formulations work well on rayon. They are not, however, very satisfactory for wool.

Q. You mentioned the possibility of using Aridye colors in combinations with water soluble dyestuffs. Is it possible to get combination shades by the resin colors falling on the dyestuffs?

A. Yes. You will get pretty much the optical effect you would expect. Yellow on blue gives green; yellow on red, orange, etc.

Q. Does it matter which falls on which?

A. In actual practice it does not seem to make a great deal of difference. We recommend that wherever possible the dyestuff be applied first, letting the Aridye fall on it.

Q. What is the back-gray problem when Aridye is used?

A. The experience of plants which are using Aridye in an extensive way is that the life of the greige is increased by 25 per cent. When necessary to wash, the usual method is employed.

Q. When Aridye is used to print rayons do you get the same shade as on cotton?

A. That depends on whether the rayon is pigmented or not. You will get much the same difference as you get with dyestuffs on cotton or rayon.

The Mechanics of Sanforizing*

J. GIRVIN CLUETT**

AS the subject of this paper is purely of a textile nature, I am assuming that, since you are present, you are engaged or interested in some branch of the textile industry. Whether or not any of you are actively interested in the shrinkage branch, I do not know, but I expect that most everyone here has encountered shrinkage either in his line of business or personally. I am not referring to shrinkage of income which no doubt you have all experienced, but to shrinkage of garments and the like. If you haven't you are fortunate, but whether you have or not, I think you will agree with me that it is common knowledge that garments made from unshrunk fabrics, and even from most of those so-called shrunk fabrics, shrink when laundered.

Manufacturers of shrinkable garments try to insure satisfaction of their customers by producing garments which are larger than size stamped, and hope that when the garments are laundered, they will shrink down to size. This oversizing in most cases is guesswork and is no longer necessary, as shrunk fabrics having a residual shrinkage no greater than 1 per cent in length or width are available. The use of these shrunk fabrics enables manufacturers to cut garments to actual size, thus completely eliminating the oversizing problem, and at the same time insures customer satisfaction.

When I tell you that there are at least, four factors which affect the cloth as far as shrinkage is concerned, you will realize why shrinkage has always been such a problem. To begin with, stretching (the primary cause of shrinkage) takes place in the manufacture of the yarns themselves. More stretching takes place in weaving, for it is impossible for a loom to operate correctly unless the warp or length threads are under considerable tension. In finishing, the cloth itself is pulled, in rope form, from one end of a bleachery to the other. This can not be done without putting tension in length on the cloth. Then too, there are, in a bleachery, width-pulling machines called tenters which put tension on the filling or width threads of a fabric. Fabrics are also sometimes stretched when being manufactured into garments, either when the material is being laid out, or when the garments are being stitched.

So you see that all through the processing of cotton fabrics, tension has been applied either in length or width; therefore, when the fabric is laundered it is only natural for the yarns to relax. This relaxing of the yarns of course results in shrinkage of the cloth, and therefore garments made from this cloth also shrink when laundered.

In order to overcome this shrinkage taking place in laundering, there have been many attempts in the past to treat cloth either chemically, or by water shrinking and drying with as little tension on the cloth as possible, or by washing the fabric. The first two methods did not shrink the cloth completely, and the third method, while producing a completely shrunk cloth, destroyed the finish and was far too expensive and clumsy to be practical.

About ten years ago a process called Sanforizing came into being. This process was and is a controlled shrinking process which, by mechanically rearranging the yarns of a fabric an amount predetermined by a full laundry

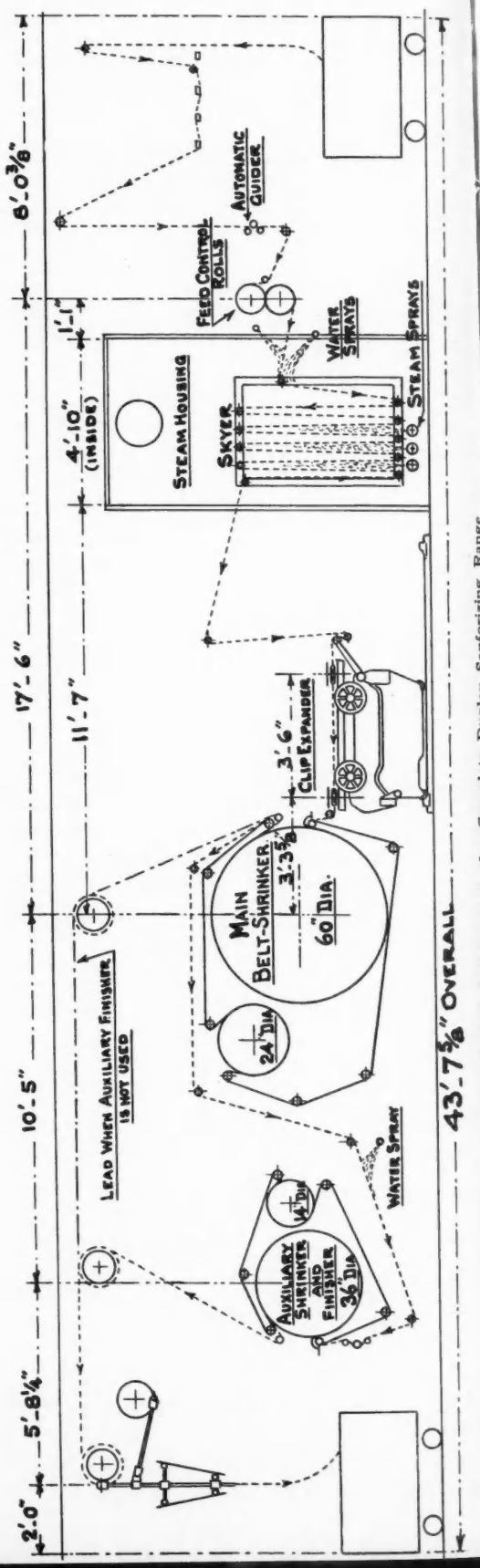
*Presented at meeting, Southeastern Section, Feb. 18, 1939.
**Cluett, Peabody & Co.

wash test, enabled garments to be manufactured which, when subjected to a standard laundry wash, changed dimensionally an infinitesimal amount or not at all. In December, 1931, at the 50th Anniversary meeting of the N. Y. Section of the A.S.M.E., Mr. Sanford L. Cluett presented a paper on this process in which he stated, "The Sanforizing process is, broadly stated, one for predetermining the superficial dimensions of a fabric and at the same time conserving and usually improving its finish. The process has been built on the principle that inasmuch as the causes of the shrinking of fabrics when they are subjected to a full laundry treatment are mostly mechanical, the most effective treatment to prevent shrinking may be found in some process of mechanically rearranging the fibers of the fabric (including changing the count of warp and filling) to the same extent that the fibers would arrange themselves if subjected to a full washing in a laundry."

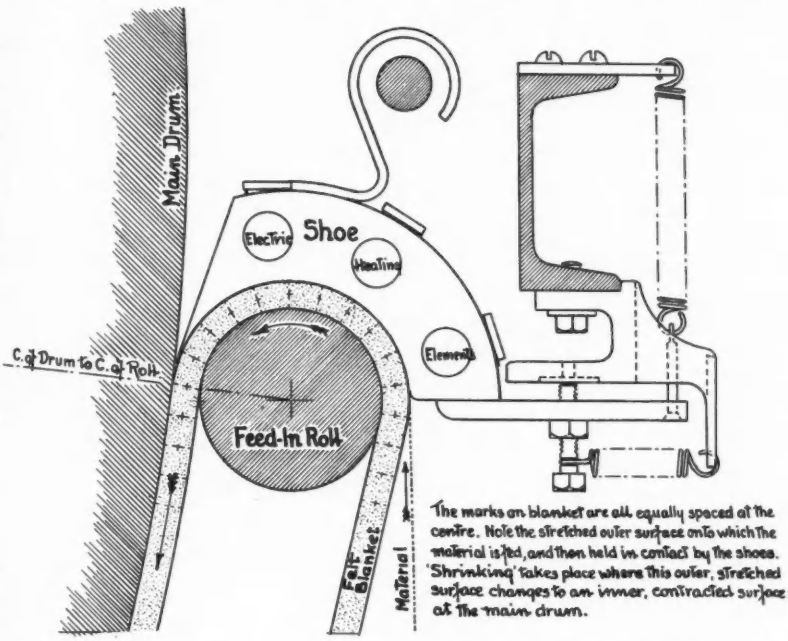
The principle of Sanforizing, at first glance, appears complicated. However, when once the simplicity of the principle of mechanical shrinking is understood, this apparent complexity disappears. To illustrate the principle of mechanical shrinking, the following explanation refers to the type of Sanforizing machine that is now in most general use. Before going into the explanation, I would like to take a few moments to mention the essential parts of the Sanforizing machine so that you will be familiar with their function when they are mentioned.

To begin with, the Rubber Control Rolls control the amount of cloth entering the machine. The spray dampens the fabric so that the individual fibers in the yarns will be soft and plastic, and thereby will be more easily compressed by the felt belt. The Skyer, as you can see from your outline, is a series of rolls around which the cloth passes on its way from the Control Rolls to the large cylinder. The passage of the fabric around these rolls gives more time for the moisture to penetrate and at the same time helps to force into the material any moisture that would ordinarily tend to remain on the surface. The Clip Expander is a small clip tenter for regulating the width of the cloth. The large cylinder labeled "Main Belt Shrinker," is steam-heated, and is used to dry the cloth after it has been mechanically compressed. The Felt Belt or Blanket is the medium that actually shrinks the cloth and after shrinking it, holds it tightly to the face of the heated cylinder until it is dried and set.

Referring to your outline sketch of the Feed Roll, Shoe, etc., this is the section where the compression of the warp yarns occurs, and is located at the front of the large cylinder just above the delivery end of the clip expander. Shrinkage is accomplished by feeding the fabric onto the stretched outer surface of the felt belt where the belt is curved around the feed-in roll; the fabric is made to adhere to the stretched surface of the blanket by the weight of electrically-heated shoes until the belt straightens out and reverses its curvature against the large steam-



Outline Arrangement of a Complete Duplex Sanforizing Range


Main Drum
Electric Shoe
Heating
Element
C. of Drum to C. of Roll
Feed-In Roll
Felt Blanket
Material
The marks on blanket are all equally spaced at the centre. Note the stretched outer surface onto which the material is fed, and then held in contact by the shoes. 'Shrinking' takes place where this outer, stretched surface changes to an inner, contracted surface at the main drum.

Outline Arrangement of Feed-in Roll, Shoe, etc.

heated cylinder; thus, when the stretched surface of the blanket is contracted by reversal of curvature, the fabric is contracted also. Compressive shrinkage of the fabric takes place when the blanket reverses its curvature to conform with that of the large steam-heated cylinder. The fabric, which has been moistened immediately after passing through the rubber control rolls, but previous to being mechanically compressed, is held against the cylinder by the blanket, until it is dried and set. The shoes are electrically heated to reduce the friction between them and the fabric because, if cold shoes were used, the friction of the steel would tend to overcome the friction of the blanket and less shrinkage would result.

It can readily be seen that bending or curving a ¼" thick belt or blanket around a 2" shaft will cause the belt to stretch or expand on its outer surface and to contract or compress on its inner surface. If a piece of cloth is now placed on the outer surface and held to the outer surface at two points about 3" apart, and then the belt and cloth are removed together and straightened out, the cloth will be found to be longer than the belt between the two points where it is held. This is exactly what happens on the Sanforizing machine only the cloth, instead of being unconfined, is confined. As a result, instead of there being a surplus of cloth when the belt reverses its curvature, the fabric will be found to have shortened to conform to the contracted surface of the blanket, not by pleating as might be expected, but by rearrangement of the yarns due to the compressive action to which they had been subjected.

The thickness of the Felt Blanket governs the maximum amount a fabric can be shortened longitudinally in one run through the Sanforizing machine. A thick blanket will shrink the cloth more than a thin one will, because the ratio which the outside radius of the blanket bears to the mean radius is greater in a thick blanket than in a thin one. The thickness of the blanket used is determined by the type of material being Sanforized and by the amount it has to be shrunk. It is always advisable to use a blanket having a greater shrinkage capacity than the maximum shrinkage required by the material being Sanforized. Sometimes it is not possible to do this. When such is the case the fabric can be run twice to obtain the required take-up. It is also advisable to have a correct fit between the blanket and the electrically heated shoe, because as stated before, it is the function of the shoes to hold the material tightly to the face of the blanket. It is not uncommon to run materials of varying thickness on one blanket, and as the diameter of the shoes is constant and as we assume the thickness of the blanket to be constant, the size of feed roll must therefore be varied according to the thickness of the material being processed. In order to contend with the various thicknesses of material, the various thicknesses of blanket, and to compensate for thinning of the blanket due to wear, a complete series of feed rolls is available, ranging in diameter from 2 1/32" to 2¾", and increasing in diameter in increments of 1/32".

The blanket at all times tries to shrink the cloth its maximum capacity. It is therefore the function of the Rubber Control Rolls to hold back the material and to let the blanket shrink the material only that amount the standard wash test, to which a sample had been subjected, shows it should be shrunk. This, of course, creates a considerable tension in length on the cloth and this tension tends to narrow the width below the width desired, if the cloth has not already come to the machine at a width

Outline Arrangement of a Complete Duplex Sanforizing Range
43'-7⅝" OVERALL
STEAM SPRAYS

narrower than that desired. It is then necessary to bring the cloth out to the required width and this is done on the Clip Expander.

In many cases cloth comes to the Sanforizing machine wider than desired. Usually the tension exerted by the blanket is sufficient to bring the width down. There are some cases, however, where the shrinkage of the cloth very nearly approaches the shrinkage capacity of the blanket, so that the cloth does not have to be held back so much by the control rolls. In these cases, the tension exerted is not sufficient to bring the width down and the width of the cloth must then either be reduced before the material is brought to the Sanforizing machine, or brought down by running twice through the Sanforizer. When running twice, the complete length shrinkage is taken up in two runs instead of in one, thereby causing more tension to be exerted on the warp yarns than would ordinarily be exerted when taking up the complete shrinkage in one run.

Fabrics that are Sanforized can be divided roughly into two groups—those requiring a smooth finish on only one side and those that require a smooth finish on both sides. Those fabrics in Group 1 are usually Sanforized on a single or Simplex machine which has only one large cylinder. The Duplex Sanforizer, consisting of Main Belt Shrinker and Auxiliary Shrinker and Finisher, more often used as an additional belt shrinking unit, is used for those fabrics requiring a smooth finish on both sides.

Your outline diagram of the Duplex Sanforizing range shows by dotted line the passage of the cloth through the machine when only the first or main cylinder is used, and also when both machines are used. The side of the fabric in contact with the shoes and with the steel cylinder will be smoother than the side in contact with the felt blanket. You will note on your outline diagram that the side of the material that was in contact with the felt blanket on the 60″ diameter cylinder is sprayed with water as the fabric passes from the first to the second unit. This sprayed side, or blanket side as it is released from the main unit, now passes underneath the shoes of the Auxiliary unit and comes into contact with the steel surface of the Auxiliary machine. The former blanket side, by this contact, is smoothed so that when the fabric is plaited into the truck, both sides have very nearly the same finish.

When the Auxiliary unit is not equipped with shoes and is used only as a finisher, it is possible by means of the spray between the two units to reverse the finish so that the former rough side will be even smoother than the former smooth side. This, however, is only done in very unusual cases. When additional shrinkage and smoothness on only one side is desired, it is possible by means of reversing bars between the two units to turn over the cloth so that the same side will be against the Auxiliary cylinder as was against the cylinder of the Main unit. The same effect can be obtained by having the two units in tandem, instead of back to back.

I have stated previously in this paper that Sanforizing is a controlled shrinking process. By controlled, I mean that the machine can be set by gears to shrink a fabric an amount pre-determined by the standard wash test. Needless to say, the gears are connected by shafting to the different parts of the machine. The Sanforizing ranges are constructed with gear changes so that any required shrinkage may be obtained up to the shrinking capacity of the felt belt with which the machine may be equipped. On most Sanforizing machines, gear boxes are located on the Rubber Control Rolls unit, on the Main Sanforizer, and on the Auxiliary Sanforizer. There are, however, several ranges constructed with no gear box on the Rubber Control Rolls unit. On these ranges, the surface speed of the control rolls is constant and the surface speed of the large cylinder is varied according to the amount of shrinkage desired.

The gear settings for the boxes located on the Main Sanforizer and on the Auxiliary Sanforizer advance in increments of ¼″ per yard, starting from zero, and are on the stretch or gain side of zero as well as on the shrink side, as it is sometimes necessary to stretch a fabric on the Sanforizer. The gear box on the control roll is on the shrink side of zero only and the settings advance, for the older machines in increments of ¼″, and for the newer machines in increments of 1″.

In order to illustrate the above, we will consider a single Sanforizer equipped with two change gear boxes, one on the Rubber Control Rolls unit, and one on the Main Belt Shrinker. When both gear boxes are set at zero, the surface speed of the large drum is the same as the surface speed of the control rolls. Under this setting there will be no change in length of material. If, however, the gear box on the Main Belt Shrinker is set at ¾″ shrinkage, and the gear box on the Control Rolls is set at 2″ shrinkage, then the surface speed of the large drum will be 2¾″ per yard slower than the surface speed of the Control Rolls, which will allow the material to be shrunk 2¾″ per yard in length.

For other settings which are on the shrinkage side, the gear setting of the Main Belt Shrinker should be added to the gear setting of the Control Rolls in order to arrive at the total shrinkage being obtained. When the setting of the Main Belt Shrinker is on the "gain" side of zero, then this setting should be subtracted from the Control Rolls setting.

It is important that the fabric be thoroughly dry before leaving the Sanforizer. Otherwise it immediately tends to elongate when released from confinement and a shrinkage less than the machine was set for will be obtained. The speed of the machine therefore should not be greater than that which will deliver the material dry. In most cases a greater speed can be obtained on light-weight fabrics than on heavier weight fabrics but there are some instances where, due to improper finish in the material, or

to its being of an open weave, it is necessary to run a light-weight fabric slower than a heavy-weight one. These cases, happily, are few and far between.

I have mentioned the standard wash test. This test, used for determining the residual shrinkage, either before or after Sanforizing, of washable cotton and linen fabrics, has been approved by the U. S. Bureau of Standards and has been labeled by them CCC-T-191a. Fabrics carrying the Sanforizing label, when tested by this method, must not show a shrinkage or gain in length or width, greater than ¾ of 1% (27" per yard).

At the present time there are 180 Sanforizing machines divided among 97 licensees, both domestic and foreign. Approximately 550 million yards of fabric are Sanforized yearly, and now on Sanforizing's tenth birthday, we find that there have been shrunk by this process to date well over a million miles of fabric, or enough yardage to make four strands of cloth from the earth to the moon.

Stainless Steel for

Textile Equipment*

JOHN H. FAUNCE, JR.**

BEFORE I get into the discussion of stainless steels I want to take this opportunity of thanking all of you and your program chairman for the invitation to be with you tonight.

My remarks will be brief as we are showing you a sound motion picture this evening entitled "The Romance of Iron and Steel." This film shows the processes of manufacture of sheet steel up until the time it goes to an equipment fabricator's plant. This is the form of metal which is made into many kinds of textile dyeing, bleaching, and wet finishing equipment.

Although this is my first AATCC meeting I have closely followed the materials of construction papers that have been presented at your meeting here, and at other sections, and the data presented has been most interesting.

The American Rolling Mill Company, like many other metals producers, carries on a large number of tests that under laboratory conditions demonstrate the feasibility of using a given type of metal for a particular application. It has been our experience that some of these give a reliable indication of the results that will be obtained in actual service. Other test data, however, have not turned out to be true under normal operating conditions.

We mentioned this because we feel that actual tests under the real conditions of service will give a better indication of the advisability of using a certain metal for a specific purpose.

The suitability of metal for dyeing, bleaching, or wet finishing units is of prime importance today, as you all know. The selection of the right pieces of equipment and the materials from which they are made will enable you to cut processing costs, decrease your losses, and improve your products. These factors are all important in the face of the present competitive situation.

The stainless steels have become widely used for textile applications during the past few years and a large amount of actual service data has been collected which shows that these alloys are admirably suited for textile work. You are, no doubt, familiar with all that these metals have to offer both from reports at these meetings as well as actual experiences.

We have found in our work in the textile field that although stainless steel has a very ready acceptance by the textile mills as well as equipment builders, there seems to be in the minds of many a question as to the most economical types of stainless that could be used for specific applications.

It would hardly be possible at this time to make any definite statement as to what grade would best be suited for any one application as there are many factors beyond our control as metal producers that have definite effects on service of equipment in the field.

However, we do want, at this time, to give you some suggestions as to what precautions can be taken in the fabrication and use of these metals that will help you obtain a maximum of service from whatever grade is used. We will also list for you a number of grade suggestions for specific pieces of equipment used under a number of service conditions. This is based on our findings in field contacts in the textile and similar industries.

We do not want you, under any circumstances, to take these suggestions as recommendations. There may be factors present in your plant that would make it possible

*Presented at meeting, New York Section, Feb. 24, 1939.
**The American Rolling Mill Co.

to use a less expensive grade or make it advisable to use a higher alloy content material. It is strongly suggested that you consult with us or any of the stainless producers prior to the installation of equipment for grade recommendations and material suggestions.

As has been explained in previous presentations, all of the stainless steels contain chromium and many of them contain nickel as well. A grade containing 18 per cent chromium and 8 per cent nickel called 18-8 is the most widely used stainless for dyeing, bleaching, and wet finishing requirements. Another grade containing approximately 18 per cent chromium, 12 per cent nickel, and from 2 to 4 per cent molybdenum is also widely used. This latter grade is sometimes called 18-8 SMo but our company calls it 18-12 SMo as this designation is nearer to the true analysis.

These two grades are all that will be considered here.

All of the stainless steels depend on the element chromium for their major corrosion resistance as this metal helps materially in the formation of a sub-microscopically thin, continuous oxide film. It is this film that gives these alloys their major corrosion resisting properties.

Since this is the case, it follows that the chromium steels will show the greatest corrosion resistance and chemical passivity under oxidizing conditions. It also follows that the corrosion resistance will be reduced or entirely eliminated if this film is destroyed.

Nickel is added to improve both the physical properties as well as the corrosion resistance of the stainless steels. The latter particularly in the presence of reducing chemicals and atmospheres, mineral acids and organic compounds.

Molybdenum markedly increases the resistance of the stainless alloys to solutions containing such chemicals as hydrochloric, acetic, and formic acids, or their salts.

Since the basic corrosion resistance of stainless steel and other metals depends on the condition of the metal surface at the time of use, the following list of precautions will help assure you of the maximum possible service that can be obtained from a given unit for a certain type of service.

1. In cases where the conditions are very severe it is advisable to use polished surfaced sheets in the fabrication of equipment.

2. Make sure that the metal parts subject to corrosion are cleaned prior to installation and use. This can be accomplished by scrubbing with a warm 20 to 30 per cent solution of nitric acid followed by a hot water rinse.

3. Allow the stainless steel to come into contact with the atmosphere occasionally. This will take care of itself naturally in cyclic operations.

4. Do not hold reducing solutions—such as hypochlorite—in units longer than six or seven hours.

5. Clean the units occasionally with alkalies or oxidizing solutions and allow them to stand clean over night.

6. Use welded joints in place of solder wherever possible. Riveted construction is also good.

7. If soldering is necessary use a silver-solder.

8. Use solid stainless wherever possible as lined tanks are liable to buckle and open at the seams due to heat expansion and contraction, and are subject to corrosion from the back side which cannot be readily checked.

9. If lining old wooden or concrete equipment, be sure in all cases to thoroughly boil out the vat prior to installing the liner. This will help to remove corrosive acids and salts present. A solution of one per cent soda ash and .5 per cent sodium silicate, or painting with asphaltic base paints before lining will prove helpful.

10. Use the correct stainless grade for each application.

If the above precautions are observed you should obtain a most satisfactory and economical service from stainless steel equipment in your dyeing, bleaching, and wet finishing plants.

The following are a few grade suggestions, (not recommendations for reasons already stated) for specific pieces of equipment operating as nearly as possible under standard service conditions.

Application	*Stainless Grade*
Ageing Equipment	18-12 SMo
Bleaching Equipment, chemic	18-12 SMo
Bleaching Equipment, peroxide	18-8
Carbonizing Equipment	18-12 SMo
Cloth Washers, Wool	18-8
Crabbing Machines	18-8
Dry Cans	18-8
Dyeing Equipment, Cotton, Silk and Rayon	18-8
Dyeing Equipment, Wool	18-12 SMo
Extractors	18-8
Fulling Machines	18-8
Kiers, Alkali	18-8
Kiers, Peroxide	18-8
Mercerizing Machines	18-8
Quetsch	18-8
Sizing Equipment	18-8
Soaking Machines	18-8
Starch Mangles	18-8
Tin Weighting Machines	18-12 SMo
Washers, Rain Stock	18-12 SMo
Washers, Print Goods	18-8

Now we will show you the motion picture which will pictorially illustrate how these various sheet metals are made from the time the ore leaves the ground until the finished steel sheet goes to a fabricator's plant.

MEMBERSHIP APPLICATIONS

Active

McBryde Albright—Hosiery Dyer, Vance Knitting Co., Kernersville, N. C. Sponsors: H. A. Walker, L. M. Boyd.

William F. Black—Asst. Dyer, Mock, Judson, Voehringer

Co., Long Island City, N. Y. Sponsors: L. S. Zisman, J. J. Sokolinski.

Samuel V. Dougherty—Dyer, Collins & Aikman Corp., Philadelphia, Pa. Sponsors: J. P. Conaway, R. M. Ritter.

Henry H. Eagar, Jr.—Superintendent, Standard Coosa Thatcher Co., Chattanooga, Tenn. Sponsors: A. H. Gaede, G. M. Cooper.

Fred W. Hartman—Dyer, Virginia Dyeing & Warping Co., Charlottesville, Va. Sponsor: T. H. McKay.

Martin L. Kesler—Research Chemist, Calco Chemical Co., Bound Brook, N. J. Sponsors: G. C. Lommel, L. I. Fidell.

William N. Kline, Jr.—Salesman, Stein Hall & Co., Charlotte, N. C. Sponsors: J. W. Ivey, J. W. Stallings.

James U. Manning—Asst. Dyer, Moorhead Knitting Co., Harrisburg, Pa. Sponsors: W. G. Hamlen, Jr., K. Krug.

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Harold C. Parish—Chemist, Skinner & Sherman, Inc., Boston, Mass. Sponsors: W. A. Kingman, W. J. Murray.

Paul Soderdahl—Chief Chemist, Hart & Harrington, Inc., Chicago, Ill. Sponsors: S. J. Hefti, D. A. Anderson.

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Junior

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S. J. Craig, Jr.—Laboratory Assistant, Pacific Mills, Lyman, S. C. Sponsors: R. E. Rupp, E. C. Jackson.

Robert Henry Eckstine—Textile Chemist, Delta Finishing Co., Philadelphia, Pa. Sponsors: J. P. Conaway, R. M. Ritter.

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Thomas S. Nichols—Vice-President, Prior Chemical Corp., New York, N. Y.

Raleigh V. Reece—Assistant to General Superintendent, American Bemberg Corp., Elizabethton, Tenn.

W. J. Schleicher—Sales Supervisor, Cowles Detergent Co., Chicago, Ill. Sponsors: D. A. Anderson, H. Boxser.

Student

Francis C. McQuillan — New Bedford Textile School. Sponsor: F. E. Busby.

Edward G. Simpson—New Bedford Textile School. Sponsor: F. E. Busby.

Alfred J. Zawisza—New Bedford Textile School. Sponsor: F. E. Busby.

Annual Meeting and Convention

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September 15 and 16

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Auspices of Northern New England Section

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SEPTEMBER 15 and 16

• COMMENCEMENT ACTIVITIES, L.T.I.

The following is the program of commencement activities recently held at the Lowell Textile Institute, Lowell, Mass.:

June 1—Deep Sea Fishing Trip on Ipswich Bay.

June 2—House Party and Outing, Ocean Park, Maine.

June 3—Fortieth Annual Reunion, Lowell Textile Alumni Association.

June 4—Baccalaureate Service.

June 5—Class Day.

June 6—Commencement Day.

Alumni Reunion

The fortieth annual reunion of the Lowell Textile Institute Alumni Association was well attended. The business meeting was presided over by Russell T. Fisher '14, president of the National Association of Cotton Manufacturers and also president of the Alumni Association. Greetings were extended by Charles H. Eames, president of the Institute, and an address entitled "Preparedness Plans" was delivered by Major B. J. Finan of the Quartermaster Corps, U. S. A. Philip F. O'Brien, '15, chairman of the textile department, New York Textile High School, was elected president for the coming year. Other officers elected included Harold V. Farnsworth, '16, vice-president, Prof. A. A. Stewart '00, secretary-treasurer and Prof. A. Edwin Wells, '20, assistant secretary. The features of the afternoon were the dedication of the Campus Fence Section by the Class of 1939 and the baseball game between the varsity and alumni teams. The festivities were brought to a close by a dinner at the Vesper Country Club.

Graduation Exercises

The 41st annual commencement exercises were held in Southwick Hall. The speaker of the day was Frederick M. Feiker, Executive Secretary of the American Engineering Council, who spoke on "The Textile Engineer's Place Tomorrow." Fifty-three men and women were awarded diplomas or had degrees conferred by President Charles H. Eames. Special awards were made as follows:

Medal of the National Association of Cotton Manufacturers—to H. Kendall Dick of Lowell, Mass.

Louis A. Olney Book Prizes—To the student graduating from the textile chemistry and coloring course who, not having already received recognition by appointment as assistant instructor, shall have maintained the highest scholarship throughout the course, in the opinion of the instructing staff of the department—to Herbert C. Olsen, Reading, Mass.

Graduates, Textile Chemistry and Dyeing Course, Lowell Textile Institute.

To the students taking the regular textile chemistry and coloring course who shall be considered as having attained the highest and second highest scholarship in second and first year chemistry;—second year: first prize, Irving P. Mintz, Passaic, N. J.; second prize, John A. Condon, Jr., North Billerica; first year, first prize, Walter Lisien, Lowell, Mass.; second prize, Irving Paul Wolf, Brooklyn, N. Y.

The following students of the chemistry course are eligible to membership in Tau Epsilon Sigma, the scholastic honorary society, on the basis of their standing for the first three years: Arthur W. Lanser, Lowell, Mass., and Edward J. F. Maslanka, Lowell, Mass.

Degrees of Bachelor of Textile Chemistry were awarded to the following: Herman Timothy Buckley, Helen Jane Jarek, Samuel Levin, Sidney Robert Marsden, Arnold Irving Miller, Harold Joseph Monahan, Hubert James Murphy, Herbert Charles Olsen, James Peter Patsourakos, William Benjamin Prescott, Warren Thomas Reddish, Jr., Clyde Burton Rowntree, Edward Spevack, Burton Cole Winkler.

• S. C. I. OFFICERS

The American Section of the Society of Chemical Industry announces the election of the following officers for the year 1939-40.

Chairman, Wallace P. Cohoe; vice chairman, Lincoln T. Work; honorary secretary, Cyril S. Kimball; honorary treasurer, J. W. H. Randall.

The following new Committe members were elected to take the place of retiring members: L. W. Bass, J. V. N. Dorr, C. R. Downs, J. C. Hostetter, E. P. Stevenson.

The Annual Meeting of the Parent Society will be held in Exeter July 10-15 and all chemists are invited.

• NEW BEDFORD TEXTILE ALUMNI

115 members and guests of the New Bedford Textile School Alumni Association met on June 10 at Fort Phoenix, Fairhaven, Massachusetts, for their annual meeting and clambake.

Thomas L. Norris, of the New Bedford Rayon Company, was elected president, Eliot Borden, vice-president; Edward Murphy, treasurer, and Malcolm Richardson, secretary, for the ensuing year.

John Foster, retiring president, announced that the William Hatch medal, awarded annually by the Alumni Association to the first year general student with the highest scholastic standing, has been changed to a key. Plans were also discussed to present a similar award to the students of the highest scholastic standing in the chemical and mechanical sections of the school. Chemistry Professor Frank Weymouth was appointed as chairman of a committee to select a suitable award and he will be assisted by Adam Bayreuther and John Dias.

Special guests included William Karl, of Akron, Ohio, a director of the Firestone Cotton Mills; Joseph J. Harney, world traveler in textiles and affiliated with the Firestone Cotton Mills in Canada, both alumni of the school; Samuel Ross of New Bedford and trustee of the school; George Barron, president of the New York Alumni Association; Representative F. Eben Brown of Fairhaven and John Regan of New Bedford, member of the Board of Trustees. All the members of the faculty also attended.

The New York Alumni chapter of the association was represented by George Barron, of the Frank W. Kunze Division of Cohn, Hall, Marx Company, John Hagen of Callaway Mills, and W. F. Macia of The A. M. Tenney Associates. Mr. Foster, Mr. Norris, Mr. Borden and Mr. Murphy were in charge of the clambake arrangements.

• AMALGAMATED CHEMICAL CORP.

Announcement is made that a number of former members of the sales and technical staffs of the W. H. & F. Jordan, Jr., Mfg. Co., have formed a new organization, known as the Amalgamated Chemical Corp., with offices and manufacturing plant located at Auburn Street and Trenton Ave., Philadelphia, Pa.

HAROLD B. DOHNER

Included in the group are Harold B. Dohner, who is president of the new concern, Robert A. Bruce, who is vice-president, John T. McGrogan, Frank T. Quinlan, John M. Jester and others well known to the textile industry.

The organization has a well equipped and modern plant and expect to release, within a short time, new permanent finishes and other products for the textile wet processing industry.

A cordial invitation is extended to all interested persons to call at their plant when in Philadelphia.

• HOSIERY CARD FORMULAS

As has been customary Geigy Co., Inc., 89 Barclay St., New York City, has prepared formulas for the Fall 1939 Hosiery Shades. They have continued making their suggestions on Chiffons, footnoted with recommendations for variations in formulas to produce these shades. They feel certain that you will be pleased with the results secured with these formulas in practice. Copies of the formulas are available upon request.

ROBERT A. BRUCE

• SALE OF BEETLE RESINS

The Beetle Products Division of the American Cyanamid Company announces that the sale of Beetle resins for textile finishing is being transferred to its affiliate, The Calco Chemical Company, Inc. This change places at the disposal of the textile finisher the specialized experience of the Beetle Products Division in the manufacture of urea resins, and of The Calco Chemical Company, Inc., in the sale and servicing of products for the textile industry.

They request that all correspondence and orders be directed to The Calco Chemical Company, Inc., Bound Brook, N. J. or its nearest branch office. Shipments as hitherto will be made from the Beetle Products Division factory at Bound Brook, N. J.

• JOINS ONYX

The Onyx Oil & Chemical Co., Jersey City, N. J., announces that Mr. R. Allan Watson has joined its staff as sales representative and mill consultant, covering the territory of Pennsylvania, Maryland, Virginia, West Virginia, Delaware and sections of New Jersey and New York.

Mr. Watson brings to his new connection, a long and varied experience in almost every phase of textile work. He formerly was instructor in Chemistry and Dyeing at the Philadelphia Textile School. For 8 years he was superintendent of dyeing at the Propper-McCallum Hosiery Co., Northampton, Mass. He has had, in addition, practical mill experience on yarns, piece goods and hosiery, plus a broad background of sales and demonstration work.

• JUNE TEXTILE RESEARCH

Gelatin Sizes Don't Penetrate Viscose—One of the important discoveries of the research on the warp sizing of filament viscose rayon, which was conducted jointly for some four years at Massachusetts Institute of Technology by the Textile Foundation and U. S. Institute for Textile Research, was a tannic acid reagent for studying microscopically the distribution of gelatin or glue size mixtures on the filaments or yarns. In sizing it is highly important to know whether the size mixture penetrates or coats the yarn, and to what extent. Until this discovery proved that size mixtures of gelatin or glue bases merely coat the filaments there was no satisfactory reagent and technique available. The method and technique are made public for the first time in a paper by Dr. W. E. Yelland, director of the research, in the June issue of *Textile Research*, monthly publication of U. S. Institute for Textile Research.

• DYESTUFFS

Copies of *Dyestuffs*, quarterly publication of the National Aniline & Chemical Co., Inc., 40 Rector St., New York, N. Y., for June, 1939, have recently been distributed. Contents are described by the following titles: Some Effects of Light in Dyeing and Allied Processes; The pH Value in the Finishing of Wool; British Royal Colors; The Penetration of Vat Dyes; Comparison of Setting Processes for Wool; The Technical Chemist; The Preparation of Hair; Causes of Unevenness in the Dyeing of Wool and Their Control (concluded from March issue). Copies of this publication are available upon request.

BOOK REVIEWS

Wetting and Detergency (*Scientific and Technical Aspects*)

This book consists of the papers presented at a Symposium held in London, Feb. 19th-20th, 1937, under the auspices of the British Section of the International Society of Leather Trades' Chemists.

It includes a Foreword by W. Clayton, D.Sc., F.I.C., 56 illustrations and 210 pages. Published by Chemical Publishing Company of N. Y., Inc., New York. 1937.

This book includes separate papers presented by twenty-six different authorities and in many instances the papers are accompanied by reports of the general discussion which followed their presentation. Each paper also presents a bibliography of the subject under consideration. The use of wetting agents has become extremely important in such industries as textiles, leather, paints, varnishes, insecticides, fungicides, flotation, solders, metal coatings, and many others.

The following enumerates the titles of different papers:

The Mechanism of Detergent Action.
The Solvent Action of Detergent Solutions.
Some Aspects of the Action of the Newer Detergents.
Detergent Problems of the Woolen and Worsted Industries.
The Penetration of Fabrics by Detergent Solutions.
The Chemistry of Wetting-Out Agents.
Apparatus for the Measurement of Contact Angles by the Plate Method.
Determination of Contact Angles on Thin Wires or Single Textile Fibers.
Wetting and Deflocculation.
The Waterproofness of Vegetable Tanned Leather.
The Wetting of Metals by Metals, with Special Reference to Solders.
The Wetting of Skin, Hides and Leather.
Wetting as a Factor in the Application of Paints and Varnishes.
The Wetting of Pigments.
Detergents and Wetting-Out Agents as Assistants in Plant Pest Control.
Some Factors in Detergency.
The Solubility of Organic Substances in Aqueous Soap Solutions.
The Bartell Cell Technique.
Flotation.
Determination of Wetting Coefficients.

Dictionary of Scientific Terms *(As Used in the Various Sciences) by C. M. Beadnell, C.B., F.Z.S. 235 pages. Published by Chemical Publishing Co. of N. Y., Inc., New York, N. Y., 1939. Price* $3.00.

This volume present a very compact general dictionary of scientific terms and includes those from practically every science. It is not a dictionary which merely gives the correct spelling or meaning of a word, but will lure the reader on to a great variety of most interesting things not generally known in regard to a great variety of subjects.

The book tells in simple language of hormones and vitamines, of wave-lengths, of the size and weight not only of the smaller entities—protons, electrons, and atoms—but also of the larger—the Earth, the Solar System and the Milky Way.

The writers have been five years in the preparation of this book. Definitions have been based on notations taken from recently published scientific books and from articles in scientific periodicals by recognized authorities. A unique feature of the book lies in the numerous cross-references, synonyms, and antonyms, which will, it is hoped, enable users to hunt up quickly words of similar, related, and opposite significance. A bibliography of many of the important books consulted during the preparation of this work is given at the end of the book.

Casein and its Industrial Applications *by Edwin Sutermeister and Frederick L. Browne. 438 pages. Published by the Reinhold Publishing Corp., 330 West Forty-Second Street, New York, N. Y., 1939. Price* $6.50.

This book is one of the monograph series of the American Chemical Society publications. It is a second edition of a book which first appeared in 1927.

This is the most complete book which has been published in regard to the natural product "casein," which has so many applications in industry. The first 180 pages are devoted to the chemical and physical properties of casein; its isolation from milk and preparation for industrial uses. Chapters are devoted to its organic and to its physical chemistry. Another chapter to testing and analyzing different caseins and also concerning its commercial handling and storage. The remaining 258 pages of the book are devoted to separate sections by authoritative authors upon the following subjects:

Casein plastics, casein glues, casein in paper making, in the manufacture of paints, in the leather industry, in medicine, in the textile industry and in soaps and cosmetics. As an appendix to the chapter on casein plastics, there is a description of lanital fiber, a product which is spun from casein in a similar manner to the spinning of the common rayons.

The first edition has been thoroughly revised and completely rewritten and as far as has been thought necessary and practicable each chapter is followed by extensive references to the citations of literature and particular attention has been given to patent references.

THE DETERMINATION OF ACID IN WOOL

THE subject of analysis for acid in wool is still up for discussion. The recent papers do not entirely agree and leave a suspicion that the last word has not yet been said, although these contributions are of interest and importance. They are to be found in the British journal "The Analyst" and will be reviewed briefly since this publication is believed not to be widely circulated in this country. The originals should be consulted for details and for the most satisfactory evaluation of the work.

As recorded in the first of these papers (Vol. 63, page 405), Trotman and Bramley compared the pyridine method, borax method, and distillation with sodium acetate followed by titration of the distillate.

With undyed wool containing sulfuric acid the borax and sodium acetate distillation methods gave very nearly the same results while the pyridine method tended to come out low, especially with the larger amounts of sulfuric acid.

The distillation method was favored as of more general use because when dyed wool is tested the titration is made on a colorless distillate rather than on an extract which may be deeply colored.

The second and later paper comments on the first and reaches somewhat different conclusions (Barritt, Bowen, Goodall and Whitehead in Vol. 63, page 782). They compared the sodium terephthalate, pyridine, and sodium acetate distillation methods.

The first was found to give somewhat lower results than the others and was not considered suitable for general use.

The sodium acetate distillation method requires a blank which is rather large and erratic, and gave variable results which could not be explained. In disagreement with Trotman and Bramley this method was not considered satisfactory.

The pyridine method was found to account for 90 to 100 per cent of the acid in known samples and the results came usually in the upper part of this range. No change from the original method was suggested. Trotman and Bramley used pyridine at 0.1 per cent solution instead of 0.5 per cent, which probably accounts for their failure to report all of the acid. Pyridine tends to increase the extraction of dyes by aqueous solutions. If the color interferes with the titration when using phenolphthalein the trouble can usually be avoided by employing thymol blue.

Following are original references to the methods of analysis which have been mentioned in this abstract. Other references will be found in the papers being reviewed, and some of the other methods are discussed.

Terephthalic Acid—Hirst and King. J.T.I. *17*, 101T (1926).

Sodium Acetate Distillation—Trotman and Gee. J. Soc. Dyers & Colourists *48*, 321 (1932).

Pyridine—J. Barritt. J. Textile Inst. *27*, 87T (1936).

The borax method (*63*, 406) was presented as new. One or two grams of wool are cut into small bits and soaked for six hours in 50 ml. of 0.2N borax solution. The decanted liquid and water from 10 careful washings are mixed and titrated with 0.1N hydrochloric acid using methyl red as indicator. The method is successful because the borax remaining after reaction with the acid in the wool can be completely removed from the wool by water.

MR. DYER, HAVE YOU HAD YOUR CARROTS?

COLOR matching efficiency "by gram or car" is now advertised, not in quite this way, but that is what it adds up to if you put a press release and an advertisement together.

Your diet affects your color matching and may not only keep you at much better efficiency but also keep you from becoming too fatigued. The original story was published in the Ohio Medical Journal by Drs. Wise and Shettler and has been relayed to us by Science Service.

In the well-known nutshell, visual purple is a very important substance in the retina of the eye, which is sensitive to light.

It becomes decomposed in the process of seeing, apparently not so much by mere looking as by real work with the eyes. Vitamin A is necessary for its regeneration and the regeneration is necessary for avoiding eyestrain, headaches and night blindness which may follow almost any excessive or prolonged use of the eyes.

Vitamin A is closely related to carotene, a yellow crystalline forty-carbon hydrocarbon, which can be isolated from carrots. Carotene is quite certainly the precursor of Vitamin A and is on the market as Pro-Vitamin A.

The theory worked, as verified by experimental evidence. Westinghouse color matchers have been given carotene in-oil in the approved guinea-pig manner and had their efficiency improved by 75 per cent, with simultaneous relief of various unpleasant symptoms. There was a tendency to an improvement in the inspector's health and a gain in weight, as well as saving in money for the company and in vision for the employee.

We do not know how many carrots it will take to make a dose of carotene and no doubt the properly controlled dose will be best. However, it is clear that carrots should be a prominent feature in the dyer's garden and if he does his duty by them we can be a little lenient if he should neglect his spinach.

CLASSIFIED

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

POSITION WANTED: Dyestuff Salesman and Demonstrator, now employed, desires to make change. New England territory preferred. Salary secondary, will consider South. Write Box No. 181, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED: Dyer with practical experience in dyeing of silk, viscose rayon, and acetate rayon; also mixed fibers. Capable to take charge or supervise all operations of dyeing; also practical experience in weighting of piece goods and skein. Expert in dyeing of chrome and Indigosol colors. Laboratory practice. Best references from leading concerns. Willing to take position as Boss-Dyer, Supervisor or Demonstrator in any part of the world. Write Box No. 185, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED: Colorist, 11 years' laboratory experience. Thorough knowledge dye testing and matching. Capable of taking charge of laboratory. Age 30 years. Married. Will go anywhere. Write Box No. 188, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

WANTED: Textile colorist for naphtazols, fast salts and vats. Kindly state your experience, education and salary desired. Our own laboratory force knows of this advertisement. Write Box No. 189, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.